

# SM-1 MINI-NOISE DIODES

## 10 KHz TO 100 MHz



### DESCRIPTION

Micronetics' SM-1 Diode with its small, surface mount SOT-23 package is ideally suited for medium and high volume production circuits. The random highly stable noise characteristic makes it ideal for several applications from encryption, to A/D dithering.

### MINI-NOISE DIODE SPECIFICATIONS

BAND	FREQUENCY RANGE	OUTPUT (1) dBm/Hz ( <i>min</i> )	BIAS (2) CURRENT ( <i>max</i> )	TYP DC+ BIAS
Band 1	10 KHz – 1 MHz	-130	2-4mA	8.7v ± 1
Band 2	1MHz – 10 MHz	-137	2-4mA	8.7v ± 1
Band 3	10 MHz – 100 MHz	-140	2-4mA	8.7v ± 1

(1) ENR is measured in a 50 ohm system.

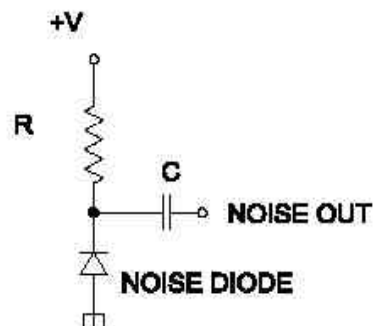
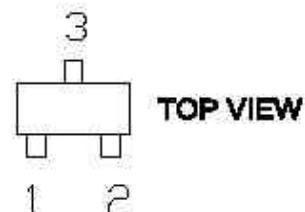
(2) Spectral response varies with bias current. Differing levels of ENR and in-band flatness can be realized by adjusting bias current.

### Application Notes:

**Encryption:** In this usage, the Gaussian output of the noise is used to generate random numbers by sampling the voltage of the noise using an A/D converter. Frequency requirements are usually a function of the system parameters of the random numbers desired. As with the dithering circuit, the noise amplitude from the diode needs to be boosted with gain. These circuits are typically high impedance.

**A/D Converter Dithering Circuit:** Sensitivity can be increased significantly when summing low frequency noise (in the range of 10 KHz - 5 MHz depending on the A/D converter) with the IF frequency prior to the input of the A/D Converter. The noise signal amplitude needs to be boosted significantly from the output of the noise diode. Designers usually take two approaches, one at 50 ohm in which standard radio frequency gain blocks are used and the noise is combined with the signal at 50 ohms. The signal + noise is then converted to high impedance prior to being fed into the A/D. The second uses op amps to boost the noise signal and the noise is summed with the signal all at high impedance and fed directly into the A/D.

**Modulating Signal Source:** The completely random nature of these analog noises have a definite advantage over pseudo-random number generators (PRNG) chips, in that there is no repetition. This is desired when a high level of communication security is required.



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NOISE PRODUCTS